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(54) **ROOFRAIL WITH FASTENING SYSTEM**

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(51) **Int. Cl.**

B60R 9/058	(2006.01)
B60R 9/08	(2006.01)
B60R 9/04	(2006.01)
F16B 5/06	(2006.01)

(52) **U.S. Cl.**

CPC . ***B60R 9/04*** (2013.01); ***B60R 9/058*** (2013.01); *F16B 5/0664* (2013.01)

(58) **Field of Classification Search**

CPC B60R 9/04; B60R 9/058; B60R 9/08; B60R 9/048; F16B 5/0664

See application file for complete search history.

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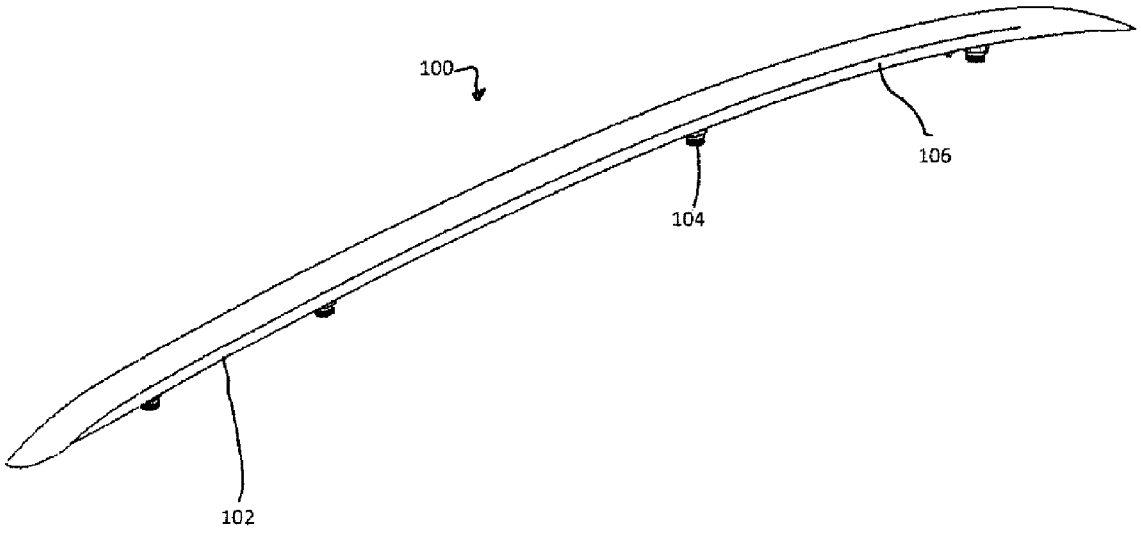
(57) **ABSTRACT**

A vehicle roof rail system includes a roof rail, a vehicle roof structure and a vehicle body structure. A tolerance compensator is disposed between the roof structure and the body structure. The tolerance compensator has an internal, oversized entry. The tolerance compensator includes an anchor fixing the tolerance compensator to the vehicle roof structure. A fastener passes through the oversized internal entry of the tolerance compensator linking the roof structure and body structure. An angle compensator is attached to the tolerance compensator. The angle compensator adjusts a contact angle of the tolerance compensator with the vehicle body structure.

26 Claims, 7 Drawing Sheets



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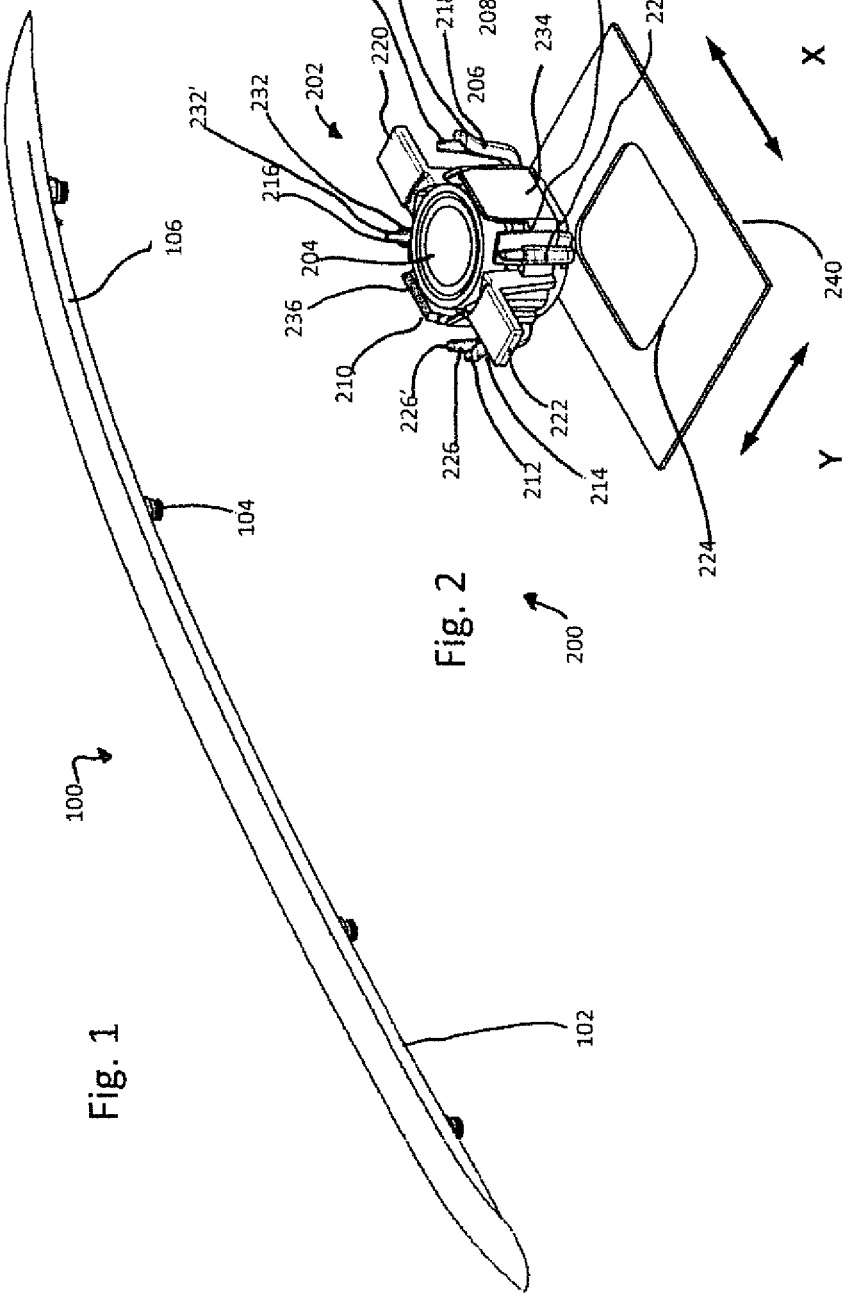

100
102
104
106

Fig. 1

200
202
204
206
208
210
212
214
216
218
220
222
224
226
226'
228
228'
230
230'
232
232'
234
236
240
X
Y

Fig. 2

Fig. 4

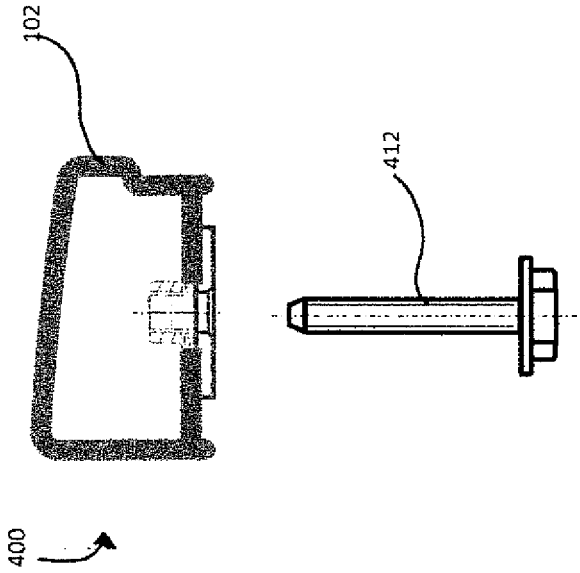


Fig. 3

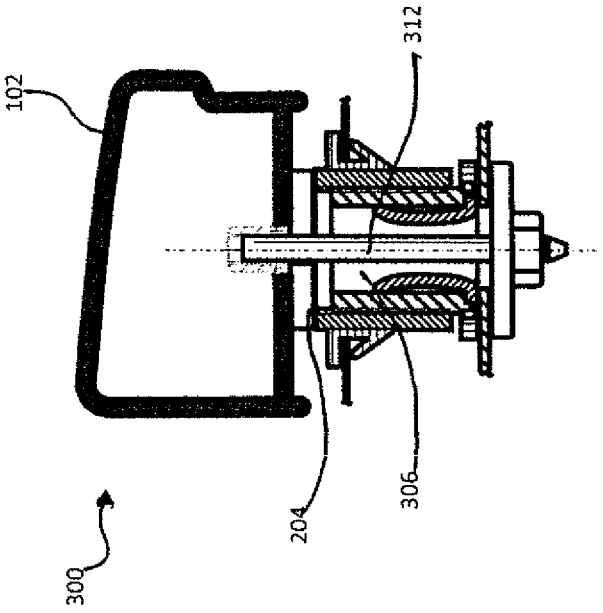


Fig. 5b

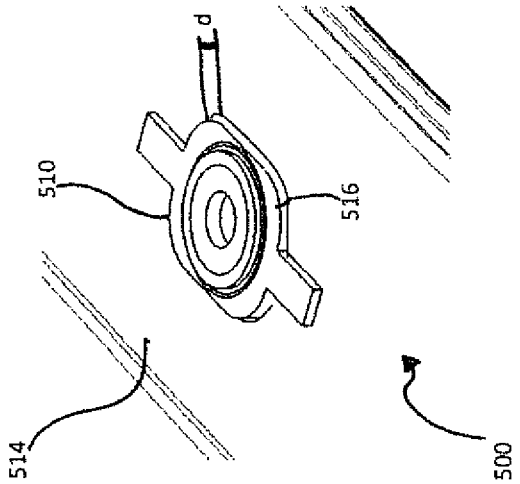
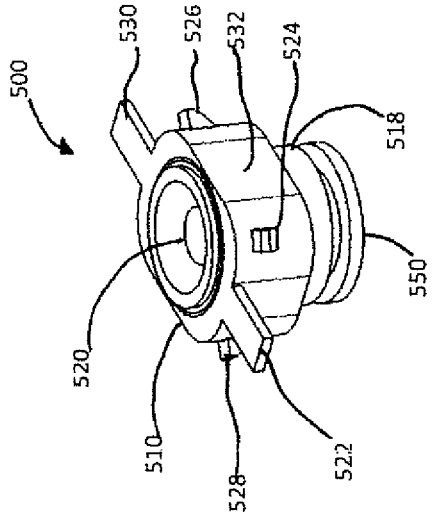


Fig. 5a



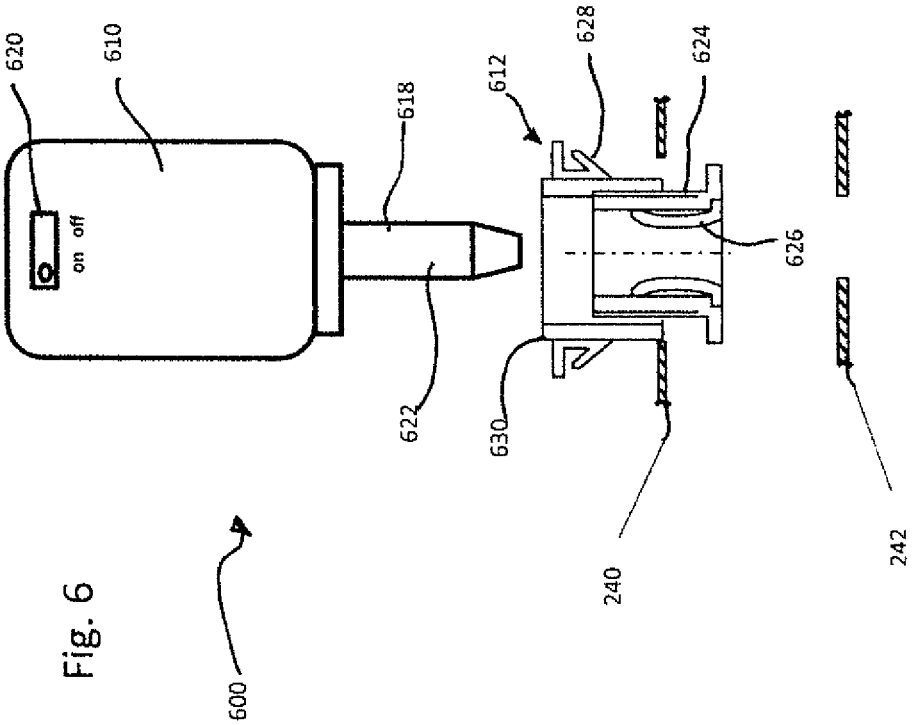


Fig. 6

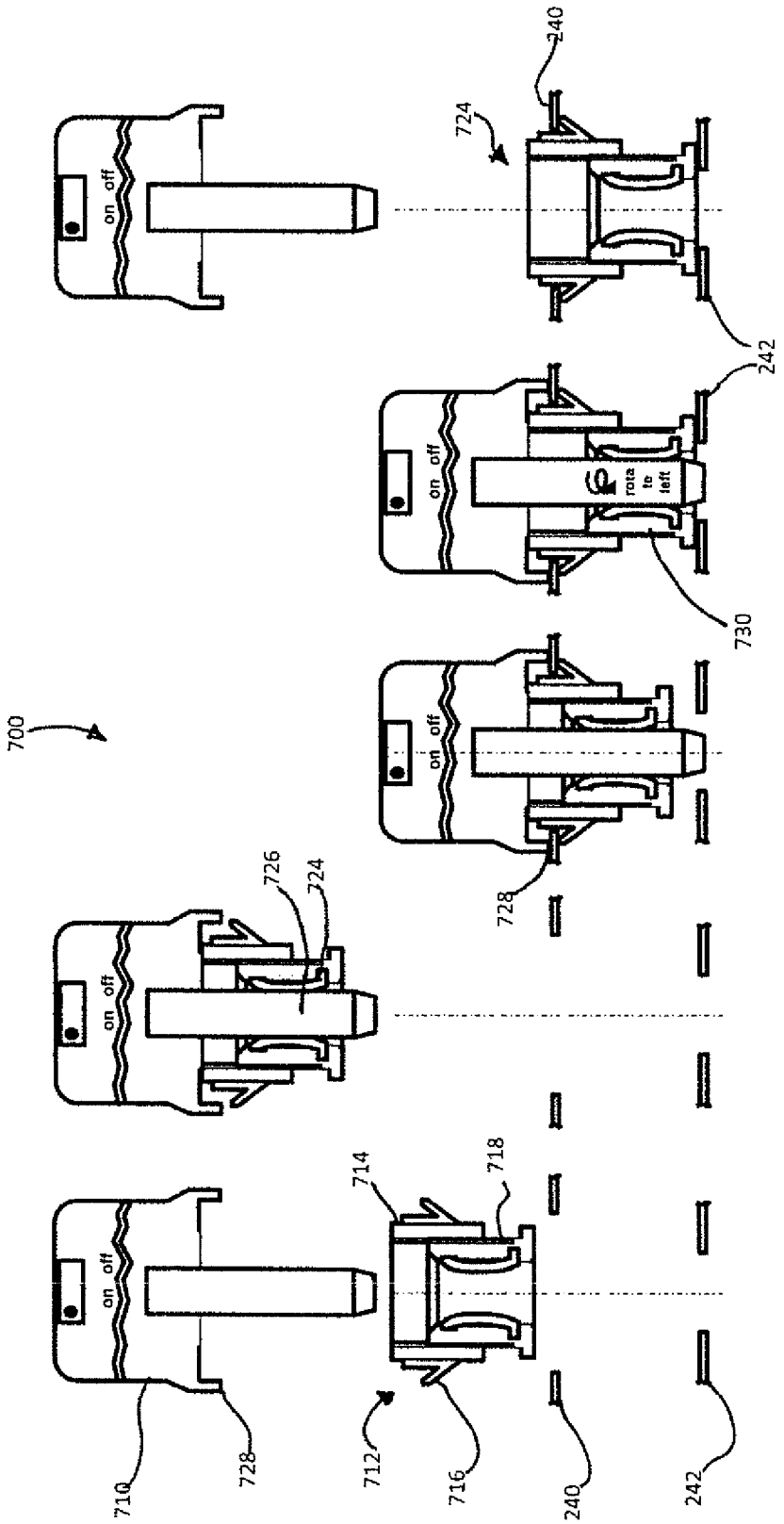

700
710
712
714
716
718
724
726
728
730
240
242
on off
rota te left

Fig. 7

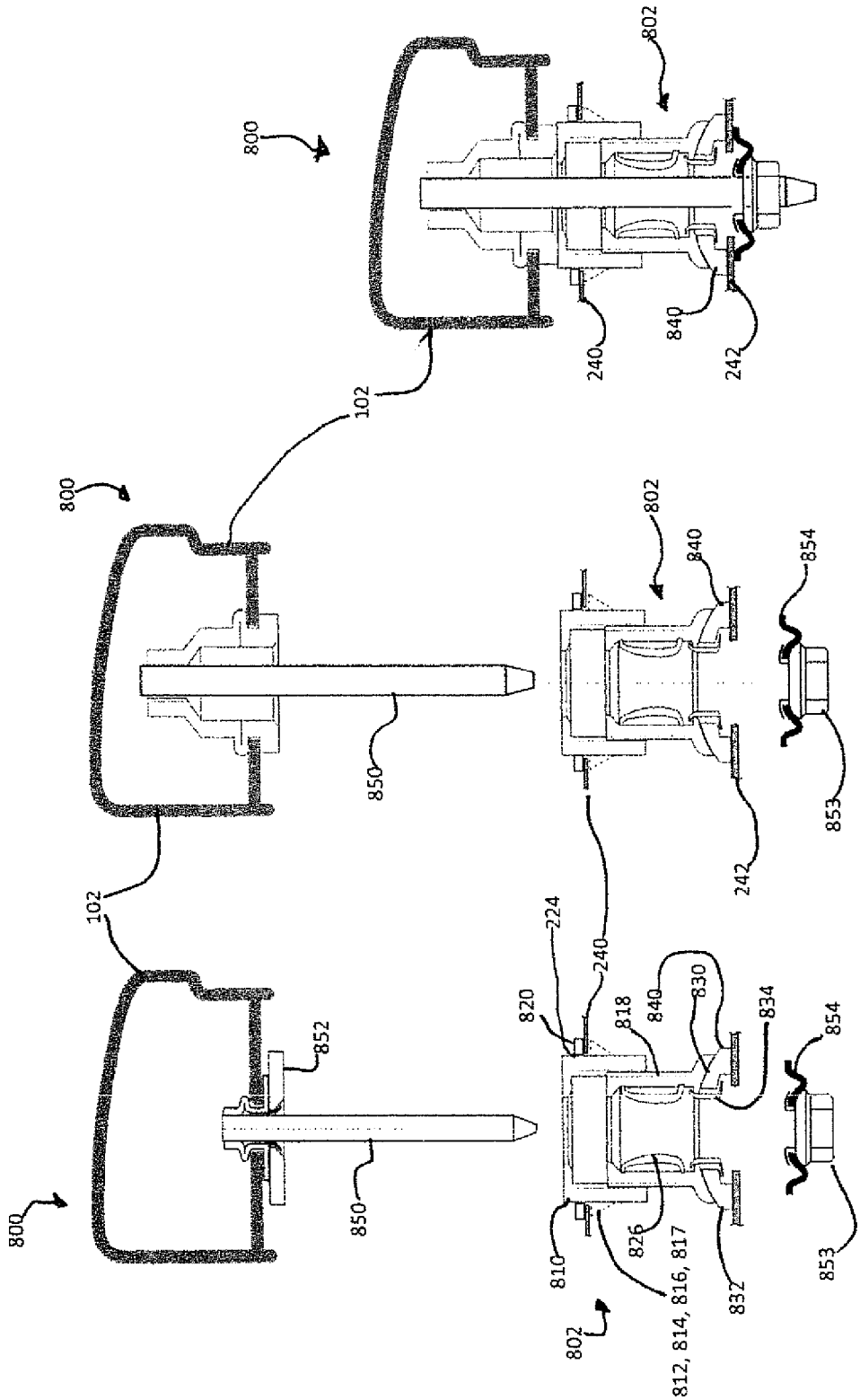


Fig. 8C

Fig. 8B

Fig. 8A

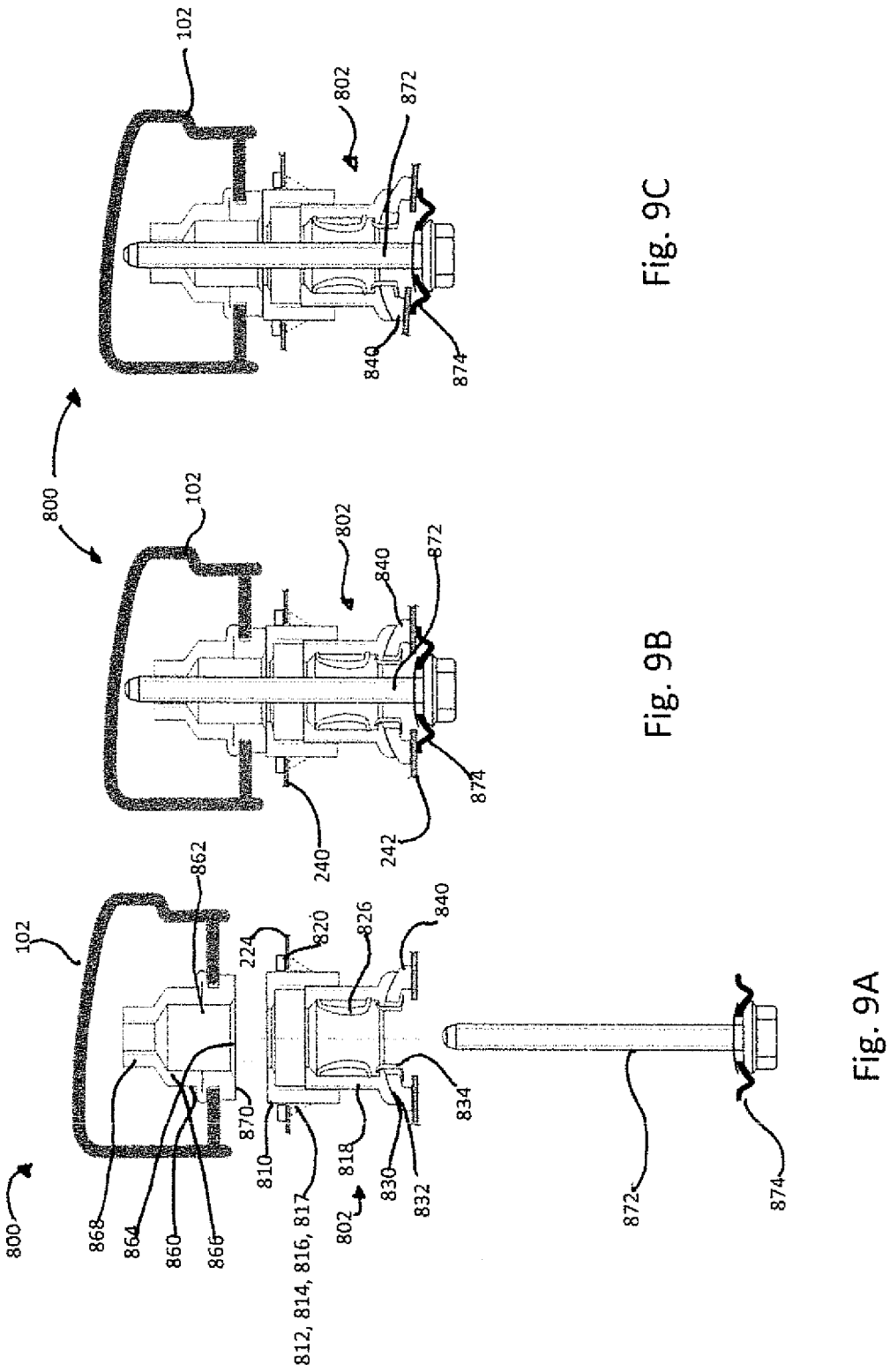


Fig. 9A

Fig. 9B

Fig. 9C

ROOFRAIL WITH FASTENING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority of U.S. Provisional Patent Application Ser. No. 61/709,652, filed Oct. 4, 2012 and U.S. Provisional Patent Application Ser. No. 61/733,327 filed Dec. 4, 2012, both of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to roof rails for motor vehicles, and more particularly to roof rails that have a fastening system with tolerance compensation.

BACKGROUND OF THE INVENTION

Roof rails are popular on many types of vehicles. They offer both functionality for carrying loads and esthetics. Many roof rails are elongate structures that are attached to the roof of a vehicle via one or more fastening systems. In modem passenger vehicles the vehicle body and the roof overlap each other near the top edge of the vehicle. As such some fastening systems connect through both the vehicle roof and the body. To connect through both the vehicle body and the roof a tolerance compensator may be used as a means of fastening the roof rail to the roof without collapsing the roof/body separation.

Fastening devices with tolerance compensation and those that anchor into hollow structures are generally known: see for example U.S. Pat. No. 7,025,552 entitled "Assembly for Automatically Compensating Variations in the Spacing Between Two Structural Members"; U.S. Pat. No. 5,288,191 entitled "Device For the Clamping Attachment of Spaced Structural Parts"; U.S. Pat. No. 4,682,906 entitled "Device For the Clamping Connection of Structural Parts Which are Spaced From Each Other"; and U.S. Pat. No. 8,066,465 entitled "Fastening Device With Tolerance Compensation" the disclosures of which are incorporated herein by reference.

However what is needed is a roof rail with an attachment system that has tolerance compensation and is easier to install.

SUMMARY OF THE INVENTION

The present invention addresses the above mentioned problem(s) and/or others by providing a vehicle roof rail system including a roof rail and a tolerance compensator.

In one aspect of the improvements disclosed herein there is provided a vehicle roof; a vehicle body structure; a tolerance compensator disposed between the roof panel and the body structure, the tolerance compensator having an oversized entry.

In another aspect there is provided an anchor fixing the tolerance compensator to a vehicle structure, such as a roof panel or body structure.

In another aspect there is provided a roof rail system including a tolerance compensator having an anchor fixed to a vehicle structure and a fastener passing through the vehicle structure through an oversized entry.

Other improvement features that may form part of the system together or separately include an anchor having a snap fit to the roof panel with an insertion force that is lower than its extraction force, a tolerance compensator with various blocks; and a tolerance compensator having an oversized entry. In various embodiments of the roof rail system, the roof rail may have a curved base. Part of the system may include a vehicle roof with a hole section having a size larger than the outer diameter of the tolerance compensator, the size of the tolerance compensator being less than 1 mm wider than the nominal gap. In another aspect of the improvements disclosed herein there may be provided a tolerance compensator with a plurality of lateral blocks that limit lateral movement of the tolerance compensator within a hole section of the roof panel to less than 1 mm in either the x or y directions while an anchor prevents movement in the z direction.

In another aspect disclosed herein the vehicle roof rail system may comprise a roof rail; a plurality of tolerance compensators, each tolerance compensator having a fixed member with a threaded portion, an expander with a threaded portion mated to the threaded portion of the fixed member, a pass through bore and an oversized entry, the tolerance compensator having an anchor with a plurality of upper roof panel blocks and a plurality of blocks. In various embodiments the blocks may include blocks that span a diameter larger that a predetermined size of an intended roof hole, the blocks having flexible arms that can flex to an outer diameter size of less than the roof hole; and a plurality of fasteners spaced along the length of the roof rail, each fastener having a shaft with an outer diameter smaller than the inner diameter of the oversized entry.

Disclosed herein is also a novel method of installing a roof rail to a vehicular roof. The method includes connecting a tolerance compensator to a rotary tool or to a vehicle structure. The method may include inserting the tolerance compensator into a hole in a vehicular roof until an anchor of the tolerance compensator engages the roof structure or body structure; activating the rotary tool to expand the tolerance compensator until the expander contacts the body structure; removing the rotary tool; and attaching the roof rail to the vehicle roof with a fastener disposed through the tolerance compensator. The fastener may be a bolt. The method of installing a roof rail may include a tolerance compensator having an inner wall inner diameter that is larger than the shaft of the roof rail fastener. The tolerance compensator may alternatively lack a vertical block that prevents over-insertion of the tolerance compensator.

For a more complete understanding of the claimed invention, reference is now made to the accompanying drawings and the following detailed description of various embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a roof-rail system;

FIG. **2** is an environmental view of a fastening system above a panel;

FIG. **3** is a cross-sectional view of a roof-rail and fastening system;

FIG. **4** is a cross-sectional view of a roof-rail and an alternative fastening system;

FIGS. **5***a* and **5***b* is a perspective view of a roof-rail fastening system in a roof panel;

FIG. **6** is a perspective view of a roof-rail fastening system;

FIG. **7** is time line view of a roof-rail fastening system;

FIG. **8**A-C are sectional views of a roof-rail fastening system;

FIG. **9**A-C are sectional views of a roof-rail fastening system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIGS. **1** and **2**, shown therein are a roof rail system **100** and a fastening system **200**. The roof rail

system **100** includes a roof rail **102** and a fastener **104**. The fastener may include a nut and bolt system. The roof rail may include a bolt fixed to the base of the roof rail. The roof rail may also include a tapped insert for connecting to a bolt. Footpads, seals and other hardware may also support the installation of the roof rail to a vehicle roof.

The fastening system may include a tolerance compensator **202**. The tolerance compensator **202** may be inserted between one or more structures and adjusted to take-up variability in distance between such structures. For example, the tolerance compensator **202** may be inserted between a roof structure **240** and a body structure **242**, such as a roof panel **240** and a body structure **242**. The systems **100**, **200** can be combined to provide a connection of the roof rail **102** to the vehicle roof **240**.

As may be appreciated from the disclosures contained herein, among other things, a roof rail system **100** can be located into fixture locations without having to independently move and realign the tolerance compensators **202** after the tolerance compensator **202** is attached to the roof panel **240**. Such an improvement is particularly useful for one or more of assembly line operations, blind attachments, roof rails with a multitude of fasteners, and/or curved roof rails which may have fasteners which are difficult to align.

A tolerance compensator **202** may be any suitable tolerance compensating device. In one form of the improvements disclosed herein, the tolerance compensator **202** has an over-sized entry **204** for a pass-through fastener **104**. The oversized entry **204** may lead to a through-bore **306**. An over-sized entry **204** is one that is sized to provide free clearance of an insert, such as a fastener insertion tip or other insert. The over-sized entry **204** may be a column of an essentially uniform shape. Alternatively the over-sized entry **204** may be comprised of a funnel shape, such as an expanded opening that tappers to a through-bore **306**. A tolerance compensator **202** with an over-sized opening **204** can provide a means of fastening the roof rail **102** to the roof **240** without collapsing the roof/body separation and without having to move the compensator **202** after anchoring it when fixturing to the roof rail **102**. As the case may be, a pass through fastener **104** may be sized with a shaft having an outer diameter that is sufficiently smaller than the through-bore **306** inner diameter to avoid simultaneous side to side contact along the inner diameter.

The tolerance compensator **202** may have at least two portions that move relative to one another to compensate for variation. The first portion may be a fixed portion **206**. The fixed portion **206** may be attached to an anchor **208**. The anchor **208** may block the tolerance compensator **202** from being removed from a seated position or alternatively may both block the compensator **202** from being removed from the seated position and over inserted into the seated position. The second portion may be an expander **210** that moves relative to the fixed portion **206**. The movement of the expander **210** may be provided by engaging threads between the fixed portion **206** and the expander **210** whereupon rotation of the expander **210** causes movement of the expander **210** relative to the fixed portion **206**. In an extended condition the fixed portion **206** can engage a first structure, such as a roof panel **240** while the expander **210** can engage a second structure, such as a body structure **242**. As such, an expander **210** together with a fixed portion **206** can span the gap between roof **240** and body **242** which distance may vary between vehicles.

The anchor **208** may be any suitable anchoring device. The anchor **208** may include one or more attachments and/or blocking features for attaching and/or positioning the tolerance compensator in a section of a vehicle roof **240** or a vehicle body **242**. The anchor may be a snap fit attachment.

The anchor **208** may include one or more extraction blocks **226**, **228**, **230**, **232**. As shown there are four extraction blocks **226**, **228**, **230**, **232**. The extraction block(s) may include ledges that are shaped to receive edges of the roof panel **240**. The extraction blocks may also include one or more retaining blocks **226'**, **228'**, **230'**, **232'** shaped and positioned to restrain the tolerance compensator **202** from sliding under or past the panel edges that form the hole section **224** of a mounting structure. As shown the retaining block **226**, **228**, **230**, **232** is a vertical block connected to or made integral with the extraction block **226'**, **228'**, **230'**, **232'**.

The tolerance compensator **202** and/or anchor **208** may include one or more over-insertion blocks **220**, **222**. Over-insertion blocks **220**, **222** may be positioned against a panel or other structure to prevent the tolerance compensator **202** from being inserted too far into the structure or past the seated position.

The tolerance compensator **202** and/or anchor **208** may include one or more lateral blocks **234**, **236**. Lateral blocks **234**, **236** may be shaped and positioned to limit lateral movement of the tolerance compensator **202** within the roof hole section **224**. In a preferred embodiment the lateral movement is limited to less than 1 mm. Limiting the lateral movement of the tolerance compensator **202** to and fore and/or side to side (together as the x-y axis) fixes the range of potential positions of the over-sized entry **204**. Limiting the range of potential positions can allow ease of assembly while compensating for manufacturing tolerance stack-up.

The anchor **208** may include one or more resilient arms **212**, **214**, **216**, **218**. The resilient arms **212**, **214**, **216**, **218** may have a span that provides an interference fit to the roof structure **240**. The resilient arms **212**, **214**, **216**, **218** may diverge from the main body of the tolerance compensator **202** at an angle. The angle may progress from an initial span smaller than a hole section **224**, through a curved portion with a span larger than the hole section **224**, to a resting ledge **229** which has a span smaller than the maximum span of the resilient arm **212**, **214**, **216**, **218**. The resting ledge **229** of the anchor **208** may be situated under the edges of the panel to block the tolerance compensator **202** from being pulled out of the hole section **224**. In one aspect, the resilient arms **212**, **214**, **216**, **218** extend at an angle from the anchor **208** such that the angle which the resilient arms diverge from the main body increases in a vertical direction upward in relation to the insertion of the tolerance compensator into the roof hole in a downward direction. The resilient arms **212**, **214**, **216**, **218** flex about a vertical or Z axis as shown in FIG. **2**.

As shown the extraction blocks **226**, **228**, **230**, **232** may be integral with the resilient arms **212**, **214**, **216**, **218** and provide the resting ledges **229**. The retaining block(s) **226'**, **228'**, **230'**, **232'** may be extended in length to provide an extractor **231**. As shown by way of one example, the extractor **231** may be a tab sized to allow compression of the resilient arms and removal of the tolerance compensator **202** from a seated position in the hole section **224** without damaging the resilient arms.

In practice the tolerance compensator **202** may be inserted into a structure with a force sufficient to flex the resilient arms **212**, **214**, **216**, **218** of the anchor **208** until an upper part of the resilient arms **212**, **214**, **216**, **218** retract, reaching an insertion point at which the resting ledges **229** move into position to secure the tolerance compensator **202**. If desired, the extractors **231** can be pressed to flex the resilient arms **212**, **214**, **216**, **218** so that the tolerance compensator **202** can be removed without damage to the anchor **208**.

Connections of the roof rail **102** to the roof **240** may be made in various ways. For example, referring now to FIG. **3** and FIG. **4**, shown in these two drawings at **300**, **400** are

optional embodiments of fastening systems, one which has a bolt **312** pre-connected to a roof rail **102** and one which includes a bolt **412** separate from the roof rail **102** for connection to a roof rail **102** after it is positioned above a roof structure. As used herein bolt/nut includes a variety of bolt nut fastening systems, including rivet-nut systems, etc.

Referring now to FIGS. **5***a* and **5***b*, shown in these drawings is another embodiment of a tolerance compensator **500**. The tolerance compensator **500** is shown in both a seated position in a vehicle structure **514** and separately **500**. The tolerance compensator **500** as shown herein includes a fixed member **510** made of a unitary piece. The unitary fixed piece may be made out of any suitable material, including plastic. In the case of plastic, the main body of the fixed piece may include the various blocks and other structures as described above in other embodiments, including one or more over-insertion blocks **522**, **530**, one or more extraction blocks **524**, **526**, **528**, etc. The tolerance compensator includes an expander **518**. The expander **518** may have an oversized entry **520**. The expander **518** may include a boot **550** for engaging the body panel which together with the fixed member spans the distance between the roof panel **240** and the body panel **242**. As show in FIG. **5***b*, the panel hole section **224** is slightly larger than the main body **510** of the tolerance compensator **220** by a distance "d". Distance d is preferably less than 1 mm.

Referring now to FIG. **6**, shown therein at **600** is a system for installing a tolerance compensator **612** between a roof structure **240** and a body structure **242**, the system including a tool **610** for installing the tolerance compensator between the structures. The tolerance compensator **612** includes a fixed portion **630** with an anchor **628** and an expander **624**. The anchor **628** may be a clip, such as a snap fit connector. The anchor **628** may also be fitted with one or more blocks as described in the other embodiments above. The anchor **628** may be molded to the fixed portion or may be a cage that fits around the fixed portion **630**. The tool **610** includes an adaptor **618** for receiving the tolerance compensator **612** and an actuator **620** for expanding and/or retracting the tolerance compensator **612** while anchored to a vehicle structure. As shown, the tool adaptor includes a shaft **622** and the expander **624** includes a compression fitting **626** sized for the shaft with an interference fit.

Referring now to FIG. **7**, generally shown therein at **700** is another method for installing a roof rail fastening system with a tolerance compensator **712** between two vehicle structures **720**, **722**. The system **700** includes a tool **710** and a tolerance compensator **712**. The two vehicle structures may be a roof panel **240** and a body structure **242**. As shown, the tolerance compensator **712** includes a fixed member **714** with an anchor **716** and an expander **718** connected to the fixed member **714**. The anchor **716** may be attached to the fixed member **714** or made integrally therewith. As shown in this example, the anchor **716** does not include an over-insertion block, which is instead provided by the tool having an over-insertion block **728**. The expander **718** may include a threaded portion with right or left handed threads that can translate the expander **718** in relation to the fixed member **714** upon rotation of the expander **718**. The tool **710** can then be used to move the expander **718** in an amount sufficient to bridge the distance between the roof panel **240** and the body panel **242**. A roof rail **102** can then be attached to the roof structure **240** via a fastener that passes through the roof panel **240**, the tolerance compensator **712** and the body structure **242**.

In practice one can install a roof rail system to the roof of a vehicle via one or more steps as followed (in no particular order). A hole section **224** is provided in the roof panel **240** of a vehicle. A tolerance compensator as described in any of the embodiments is connected to a rotary tool. The tolerance compensator is inserted into the hole section **224** of the roof panel **240** until the anchor of the fixed member engages the roof panel **240**. The tool supports the tolerance compensator until the tolerance compensator is expanded to span the gap between the roof panel **240** and the body structure **242**. The tool is then removed from the tolerance compensator. A roof rail **102** with a fastener **104** is provided. A bolt is passed through the tolerance compensator and a bolt, washer or other fixing device is provided on the fastener to secure the roof rail **102** in place. Alternatively, the tolerance compensator may be attached to the roof structure **240** prior to engaging the tool.

Referring to FIG. **8**A-C there is shown another alternative embodiment of a roof rail system **800** and tolerance compensator **802**. In the depicted embodiment, the tolerance compensator **802** includes fixed member **810** made of a unitary piece. The unitary fixed piece may be made out of any suitable material, including plastic. In the case of plastic, the main body of the fixed piece may include the various blocks and other structures as described above in other embodiments, including, one or more extraction blocks **824**, **826**, **828**, etc. The tolerance compensator **802** includes an expander **818**. The expander **818** may have an oversized entry **820**, as previously described above. Additionally, the expander **818** may include a compression fitting **826** as described above. In another aspect, the panel hole section **224** is slightly larger than the main body **810** of the tolerance compensator **802** by a distance d that is preferably less than 1 mm. In one aspect, the resilient arms **812**, **814**, **816**, **817** extend at an angle from the anchor **808** such that the angle which the resilient arms **812**, **814**, **816**, **817** diverge from the main body **810** increases in a vertical direction upward in relation to the insertion of the tolerance compensator **802** into the hole section **224** in a downward direction. The resilient arms **812**, **814**, **816**, **817** flex about a vertical or Z axis.

The tolerance compensator **802** may include an angle compensator **840**. An angle compensator **840** can be used to take up variation in vertical alignment. The angle compensator **840** may include a slide **841**. The angle compensator **840** may be attached to the expander **818**. In the embodiments shown, the angle compensator **840** includes a slide **841** with a curved surface that can adjust when seated on an angular surface in relation to a vertical insertion direction.

The expander **818** may include a curved or angled attachment section **830** that mates with a corresponding curved or angled portion **832** of an angle compensator **840**. In one aspect, the expander **818** may be coupled to the angle compensator **840** utilizing an attachment ring **834**. In one aspect the expander **818** may include ledge structures **820**, **822** that allow the attachment ring **834** to seat in the expander **818** and angle compensator **840**. The attachment ring **834** or other attachment structure allows for sliding movement of the curved surface **832** of the angle compensator **840** on the curved surface **830** of the expander **818** such that an angle of contact of the tolerance compensator **802** with the vehicle body structure **242** is adjusted. In this manner, angular tolerances associated with the body structure **242** may be accommodated for a secure attachment of the roof rail **102** to the body structure **242**. In an alternative aspect, the compression fitting **826** may be formed in one piece with a section that connects the expander **818** to the angle compensator **840** or may have a separate connection ring **834** as previously described.

The roof rail **102** and tolerance compensator **802** structure of the alternative embodiment of FIGS. **8**A-C includes various connections of the roof rail **102** to the roof **242** and body structure **242**. In the embodiment depicted in FIG. **8**A the roof

rail **102** may include a rivet stud **850** that is crimped onto a washer **852** and attached to the roof rail **102**. In the embodiment depicted in FIG. **8**B, the connection may include a one piece rivet stud **850** attached to the roof rail **102** that does not include the washer in FIG. **8**A. The washer **852** and rivet stud may act as a bearing surface for the tolerance compensator **802**. Various rivet studs **850** may be attached to the roof rail **102** and serve as a connection of the roof rail **102**, roof **240** and body structure **242**. The rivet stud **850** may be connected to a nut **853** that couples the roof rail **102**, tolerance compensator **802**, roof **240** and body structure **242** to form a roof rail system.

In one aspect, the nut **853** may include an angle compensating washer **854**. The nut **853** including the angle compensating washer **854** connects to the rivet stud **850** on an opposing side of the body structure **242** in relation to the angle compensator **840**. In this manner the angle compensating washer **854** contacts the body structure **242** to accommodate an angle of the body structure **242** on both sides of the body structure **242** in conjunction with the angle compensator **840**.

Alternatively, as shown in the embodiment of FIGS. **9**A-C, the roof rail **102** may include a rivet nut **860** attached to the roof rail **102**. The rivet nut **860** includes a bore **862** formed therein. The bore **862** includes an oversized bore section **864** connected to an angled portion **866** that terminates at an attachment section **868**. In one aspect, the rivet nut **860** includes a bearing surface **870** that mates with the tolerance compensator **802**. In this embodiment, a bolt or fastener **872** is fed from the body panel **242** to the roof rail **102**. In one aspect, the fastener **872** includes an angle compensator washer **874**. As with the previously described embodiment of FIG. **8**, the angle compensating washer **874** of the fastener **872** contacts the body structure **242** on an opposing side of the body structure **242** in relation to the angle compensator **840**.

While the improvements have been illustrated in detail in the drawings and the foregoing description, the same is to be considered as illustrative and not restrictive in character. What are included in the descriptions above are, among other things, various rail and rail attachment systems that permit a rail having a fastener to be attached to a vehicular roof by fixing the locations of a series of tolerance compensators relative to a set of holes and inserting fasteners into oversized entry holes. Such systems can alleviate the need to adjust the position of the tolerance compensators at the time of installing the roof rail. Therefore, it should be understood that only example embodiments have been shown and described fully and that each of the features presented can be used separately or combined on an element by element basis as needed for the intended application.

The invention claimed is:

1. A vehicle roof rail system comprising:

a roof rail;

a vehicle roof structure;

a vehicle body structure separated from the vehicle roof structure by a predefined distance;

a tolerance compensator disposed between the roof structure and the body structure and spanning the predefined distance, the tolerance compensator having an internal, oversized entry;

an anchor fixing the tolerance compensator to the vehicle roof structure;

a fastener passing through the oversized internal entry of the tolerance compensator linking the roof structure and body structure;

an angle compensator attached to the tolerance compensator, the angle compensator adjusting a contact angle of the tolerance compensator with the vehicle body structure.

2. The vehicle roof rail system of claim **1**, wherein the anchor has a snap fit to the roof structure with an insertion force that is smaller than the extraction force.

3. The vehicle roof rail system of claim **1**, wherein the tolerance compensator has at least one lateral block which limits either cross-car or fore-aft movement of the tolerance compensator about the roof structure.

4. The vehicle roof rail system of claim **1**, wherein the tolerance compensator has at least one retaining block.

5. The vehicle roof rail system of claim **1**, wherein the at least one resilient arm that engages the roof structure with an interference fit and limits lateral movement of the tolerance compensator within a hole section of the roof panel to less than 1 mm in either the cross-car or fore-aft directions.

6. The vehicle roof rail system of claim **1**, wherein the resilient arms flex about a vertical or Z axis.

7. The vehicle roof rail system of claim **1**, wherein the vehicle roof structure further includes a hole section with a size larger than the outer diameter of the tolerance compensator by less than 1 mm wider but a size greater than the outer diameter of the at least one lateral block.

8. The vehicle roof rail system of claim **1**, wherein the tolerance compensator has a plurality of lateral blocks that limit lateral movement of the tolerance compensator within a hole section of the roof structure to less than 1 mm in either cross-car or fore-aft directions.

9. The vehicle roof rail system of claim **1**, wherein the tolerance compensator has at least one extraction block connected to at least one resilient arm.

10. The vehicle roof rail system of claim **1**, wherein the anchor includes a fixed member and an expander connected to the fixed member.

11. The vehicle roof rail system of claim **10**, wherein the expander includes an oversized entry.

12. The vehicle roof rail system of claim **10** wherein the expander includes a curved attachment section.

13. The vehicle roof rail system of claim **12** wherein the angle compensator includes a curved movement section, the curved movement section sliding on the curved attachment section.

14. The vehicle roof rail system of claim **1** wherein the anchor includes a through bore having a compression fitting.

15. The vehicle roof rail system of claim **1** wherein the roof rail includes a rivet stud attached thereon and further including a corresponding nut having an angle compensator washer.

16. The vehicle roof rail system of claim **15** wherein the angle compensator contacts the body structure on one side of the body structure and the nut having the angle compensating washer contacts the body structure on an opposing side of the body structure.

17. The vehicle roof rail system of claim **15** wherein the rivet stud includes a crimped on washer bearing against the tolerance compensator.

18. The vehicle roof rail system of claim **15** wherein the rivet stud includes a bearing surface bearing against the tolerance compensator.

19. The vehicle roof rail system of claim **1** wherein the roof rail includes a rivet nut attached thereon and further including a corresponding fastener having an angle compensator washer.

20. The vehicle roof rail system of claim **19** wherein the angle compensator contacts the body structure on one side of

the body structure and the fastener having the angle compensating washer contacts the body structure on an opposing side of the body structure.

21. The vehicle roof rail system of claim **19** wherein the rivet nut includes a bore formed therein, the bore including an oversized bore section connected to an angled portion that terminates at an attachment section.

22. The vehicle roof rail system of claim **19** wherein the rivet nut includes a bearing surface therein that mates with the tolerance compensator.

23. A vehicle roof rail system comprising:

a roof rail;

a vehicle roof structure;

a vehicle body structure;

a tolerance compensator disposed between the roof structure and the body structure, the tolerance compensator having an internal, oversized entry;

an anchor fixing the tolerance compensator to the vehicle roof structure, the anchor including a fixed member and an expander connected to the fixed member;

a fastener passing through the oversized internal entry of the tolerance compensator linking the roof structure and body structure;

an angle compensator attached to the tolerance compensator, the angle compensator adjusting a contact angle of the tolerance compensator with the vehicle body structure.

24. A vehicle roof rail system comprising:

a roof rail;

a vehicle roof structure;

a vehicle body structure;

a tolerance compensator disposed between the roof structure and the body structure, the tolerance compensator having an internal, oversized entry;

an anchor fixing the tolerance compensator to the vehicle roof structure;

a fastener passing through the oversized internal entry of the tolerance compensator linking the roof structure and body structure;

an angle compensator attached to the tolerance compensator, the angle compensator adjusting a contact angle of the tolerance compensator with the vehicle body structure wherein the roof rail includes a rivet nut attached thereon and further including a corresponding fastener having an angle compensator washer.

25. A vehicle roof rail system comprising:

a roof rail;

a vehicle roof structure;

a vehicle body structure;

a tolerance compensator disposed between the roof structure and the body structure, the tolerance compensator having an internal, oversized entry;

an anchor fixing the tolerance compensator to the vehicle roof structure;

a fastener passing through the oversized internal entry of the tolerance compensator linking the roof structure and body structure;

an angle compensator attached to the tolerance compensator, the angle compensator adjusting a contact angle of the tolerance compensator with the vehicle body structure wherein the roof rail includes a rivet nut attached thereon and further including a corresponding fastener having an angle compensator washer wherein the roof rail includes a rivet stud attached thereon and further including a corresponding nut having an angle compensator washer wherein the angle compensator contacts the body structure on one side of the body structure and the nut having the angle compensating washer contacts the body structure on an opposing side of the body structure.

26. A vehicle roof rail system comprising:

a roof rail;

a vehicle roof structure;

a vehicle body structure;

a tolerance compensator disposed between the roof structure and the body structure, the tolerance compensator having an internal, oversized entry;

an anchor fixing the tolerance compensator to the vehicle roof structure;

a fastener passing through the oversized internal entry of the tolerance compensator linking the roof structure and body structure;

an angle compensator attached to the tolerance compensator, the angle compensator adjusting a contact angle of the tolerance compensator with the vehicle body structure and wherein the tolerance compensator has at least one resilient arm that engages the roof structure, the at least one resilient arm extending at an angle from the anchor such that the angle which the resilient arms diverge from a main body increases in a vertical direction in relation to the insertion of the tolerance compensator into the roof structure.

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